

Claims

We Claim:

- 5 1. A chemical-library composition comprising
 - (a) a plurality of coded carriers, each having $N > 1$ specified code positions and one of $M > 1$ detectable indicia at each code position, such that each carrier can be identified by one of up to M^N different code combinations, and
 - 10 (b) a different known chemical compound carried on each different-combination carrier.
2. The composition of claim 1, wherein each of said carriers is formed of N separate layers, each layer having one of M different color indicia.
- 15 3. The composition of claim 2, wherein each carrier is a cylinder of stacked layers, where the cylinder diameters are in the 1 to 200 micron range.
4. The composition of claim 1, wherein each of said carriers has a surface that is partitioned into N surface regions, and each region contains one of at least two different surface indicia.
- 20 5. The composition of claim 1, wherein each of said carriers has a magnetic layer or component that allows for magnetic separation and orientation of said carriers.
- 25 6. The composition of claim 1, wherein the different compounds in the composition are oligonucleotides or peptide nucleic acids having a known identifiable characteristic, usually the nucleotide sequence.
- 30 7. The composition of claim 1, wherein the different compounds in the composition are oligopeptides having a known identifiable characteristic, usually the amino acid sequence.

8. The composition of claim 1, wherein the different compounds in the composition are small chemical compounds having known identifiable characteristics, usually the structural formulae.

5 9. A method of forming a library of determinable chemical compounds, comprising the steps of

- 10 (a) placing into each of a plurality of a separate reaction vessels, carriers having a selected one of a plurality of detectable code combination, each defined by one of $N > 1$ specified code positions and one of $M > 1$ detectable indicia at each code position, such that the carriers in any vessel all have one of up to M^N different code combinations,
- (b) reacting the carriers in each vessel with reagents effective to form on the carriers, as solid-supports, a selected one of up to M^N different known library compounds, and
- 15 (c) forming a mixture of carriers from different reaction vessels.

20 10. The method of claim 9, wherein said reacting includes the steps in a stepwise oligomer synthesis reaction effective to form oligomers with known or random sequences on the solid-support carriers.

25 11. A method of detecting one or more target molecules capable of binding specifically to one or more different, known library compounds, comprising

(a) contacting the target molecule(s) with a chemical-library composition composed of

- 30 (i) a plurality of coded carriers, each having $N > 1$ specified code positions and one of $M > 1$ detectable indicia at each code position, such that each carrier can be identified by one of up to M^N different code combinations, and
- (ii) a different known library compound carried on each different-combination carrier, under conditions in which the target molecules can bind specifically to known library compounds,

(b) distributing the carriers for individual-carrier decoding, and

(c) detecting carriers having bound target molecule(s) and

(d) decoding the carriers having bound target molecules, to identify the library compound(s) to which the target molecule(s) are bound.

12. The method of claim 11, wherein said distributing includes placing the carriers at discrete locations on a substrate surface, and said detecting and decoding is carried out by a detector operable to scan the substrate surface.

13. The method of claim 11, wherein each carrier is a cylinder formed of N separate layers, each layer having one of M different color indicia, and said distributing includes flowing said cylinders through a capillary tube, past a detector.

14. The method of claim 11, wherein each carrier is a cylinder formed of N separate layers, each layer having one of M different color indicia, and said distributing includes aligning said carriers in a capillary tube, and moving said tube relative to a detector.

15. A method of multiplexing the detection and quantification of analytes comprising the steps of:

- (a) distributing on a surface a plurality of coded carriers having different compounds attached to different carriers,
- (b) scanning the surface for carriers having a detectable reporter,
- (c) recording the positions of the carriers having a detectable reporter,
- (d) determining the code for each carrier at each recorded position.

16. An array device comprising,

- (a) a surface, and
- (b) a plurality of coded carriers having different compounds attached to different carriers, wherein the carriers are randomly distributed upon the surface.

17. The array device of claim 16 where the surface is a glass slide.

18. A kit comprising

a plurality of separated classes of compoundless coded carriers,
wherein each class contains a plurality of compoundless coded
carriers,

- (a) each carrier within that class having the same code, and each
different class having compoundless coded carriers having a
different code, and
- (b) each compoundless coded carrier is capable of having a
compound attached thereto.

19. The composition of claim 1 wherein each of said carriers is formed as thin
transverse sections of an assembly comprising N pre-existing filaments of M
different colors and bundled together such that when sectioned they produce
carriers with M color indicia at each of N positions.

20. The composition of claim 1, wherein the carrier indicia is a nanocrystal.

21. A method of detecting two or more target molecules in an analyte capable of
binding specifically to two or more known different compounds on different
carriers from a carrier library contained in an sample, comprising the steps of

- (a) partitioning the carrier library into a plurality of sublibraries and splitting
the analyte into a plurality of subanalytes,
- (b) contacting each subanalyte with a sublibrary in a condition in where each
target molecule can bind specifically to corresponding sublibrary carriers
and where conditions are independent for each sublibraries,
- (c) pooling together carriers from all sublibraries,
- (d) distributing the carriers on a surface,
- (e) detecting carriers having bound target molecule(s) and
- (f) decoding the carriers having bound target molecules, to identify each
compound that bound target molecules are bound.

22. A method of multiplexing the detection and quantification of analytes comprising the steps of:

- (a) attaching probes specific for a set of analytes to a corresponding set of specifically designated distinguishable carriers;
- (b) reacting said designated distinguishable carriers with said analytes;
- (c) measuring signal in association with each said designated distinguishable carrier.

23. The method of claim 22 where the carriers are deposited on a surface.

24. The method of claim 23 where the analytes are determined by a combination of features inherent to the carriers and the position of the carriers on the surface.

25. The composition of claim 2 where the layers are fused glass fibers.

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